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# Energy saving instrument – ESCerts in India

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ABSTRACT

There exists a large potential in India as far as achievement of energy efficiency is concerned and it is up to the Indian policy-makers, regulators and obligated entities to ensure that India realizes this potential to the fullest. A deep commitment towards this effect is not only beneficial for the country as a whole through reduction in its carbon foot print and reduced dependence on fuel imports but will also increase the competitive edge of our industries vis-à-vis other countries. One of the instruments for improving the overall energy efficiency that has emerged in recent times is energy saving certificates (ESCerts). The staying power of European examples in Italy, UK and France has demonstrated that ESCerts can help initiate more efficiency projects. This paper discusses ESCerts as an instrument for reducing the energy intensity of the high energy intensive Indian industries under the light of the Energy Conservation Act, 2001 and Perform Achieve and Trade scheme (under NMEEE) and suggests a way forward for the ESCerts market in India.



**Contents**



## 1. Introduction

Moving towards a less energy intensive path for India has come to center stage as a means to tackle the twin concerns of energy security and climate change. Moreover, it is clear that reducing energy intensity at the micro level makes for sound business investment through reduced energy bills and improved competitiveness and productivity of the domestic firms [1].

To start with, a look at the commercial energy consumption data for India [2] reveals that energy consumption has increased by 3.4 times during the period 1980–81 to 2006–07. Further, sector-wise breakdown of commercial energy consumption throughout the said period yielded that, industrial sector continued to remain the dominant sector, even though its share declined from 54% in

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**Table 1**
Commercial energy consumption in India, by sector (in MTOE).

| Sector | 1980–81 | 1985–86 | 1990–91 | 1995–96 | 2000–01 | 2005–06 | 2006–07 |
|---|---|---|---|---|---|---|---|
| Agriculture | 1.6 | 2.4 | 4.9 | 8.4 | 15.2 | 15.1 | 16.8 |
| Industry | 36.9 | 49.2 | 62.9 | 77.5 | 77.4 | 96.2 | 102.9 |
| Transport | 17.4 | 21.7 | 28 | 37.2 | 33.5 | 36.5 | 40.3 |
| Residential and commercial | 5.6 | 8.9 | 12.6 | 15.3 | 24.1 | 32.6 | 35 |
| Other energy uses | 1.9 | 2.7 | 3.9 | 6.8 | 13.4 | 18.7 | 16.5 |
| Non-energy uses[a] | 5.3 | 7.9 | 12.6 | 14.1 | 28 | 17.5 | 18.4 |
| Total | 68.7 | 92.8 | 124.9 | 159.3 | 191.6 | 216.5 | 229.9 |

TERI Energy Data Directory and Yearbook 2009.
MTOE – million tons of oil equivalent.
[a] Includes fertilizers, petrochemicals and sponge iron use.

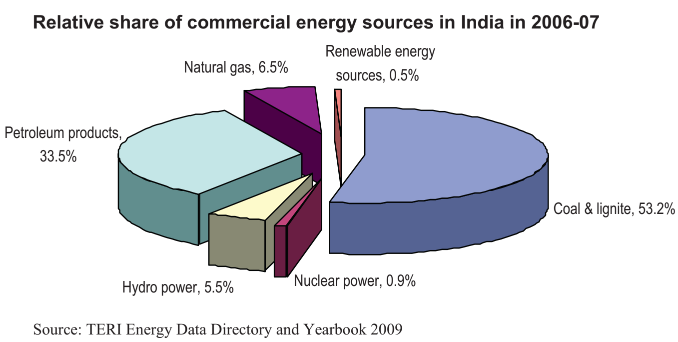



**Fig. 1.** Percentage share of commercial energy sources in India in 2006–07.

**Table 2**
Industry energy intensities (GJ/t).

| Industrial sub-sectors | 1990 | 2005 | 2020[a] | Best practices |
|---|---|---|---|---|
| Crude steel | 42 | 29 | 27 | 17.8 |
| Aluminum | 399 | 365 | 344 | 144[b] |
| Cement | 3.6 | 3.1 | 2.9 | 1.9[c] |
| Pulp paper | 35 | 24 | 23 | 17[d] |
| Ammonia | 55 | 43 | 40 | 28 |

Rue du Can S et al. (January 2009).
[a] Projected figures.
[b] Here primary electricity is calculated as India intensity include own use generation, an electricity conversion efficiency of 33% was used for best practices.
[c] Blast furnace slag cement plant.
[d] Wood based paper mill.

1980–81 to 45% in 2006–07. The next sector in line is the residential and commercial sector that grew by 6 times during the period 1980–81 to 2006–07, though its share in 2006–07 stands at 15% only. However, in terms of percentage growth in consumption of commercial energy, the residential and commercial sector exhibit slowing down of growth rate in recent years[1] (Table 1).

On the other hand, from the supply side, the demand for commercial energy in India is largely met by the coal and lignite energy sources that are essentially polluting in nature. In addition, India's energy basket also includes petroleum products, natural gas, hydro power, nuclear power and renewable energy sources. Fig. 1 shows the percentage share of commercial energy sources in India in 2006–07. The percentage contribution of coal and lignite resources was more than 50% while that of renewable energy sources was only 0.5% to the total commercial energy sources in 2006–07.

Therefore, with a view to lower India's energy intensity, it is imperative to carry out a more detailed study of the industrial sector that still consumes the maximum amount of energy among all the other sectors (see Table 1). Table 2 shows the energy intensity (in giga joules per ton) of some of the major Indian industrial sub-sectors for 1990, 2005 and 2020 [3].

Table 2 shows that aluminium industry is the most energy intensive compared to others and there exists a scope of reducing the energy intensity by 58%[2] in this sub-sector when compared to the world's best practices data[3] for industrial energy intensities. Similarly, the crude steel and cement industrial sub-sectors have a scope of reducing energy intensity by 34% each.

Given the magnitude of scope that exists in the Indian industries for achieving energy efficiency, this paper discusses the PAT (Perform Achieve Trade) scheme, proposed by BEE (Bureau of Energy Efficiency) in detail. The PAT scheme aims at reducing the energy intensity of Indian industries by targeting the 9 most energy intensive industrial sub-sectors[4]. In connection with the abovementioned scheme, the paper examines the energy saving certificates in India in terms of its current status and consequently makes recommendations towards the functioning of the energy savings certificates market in India in the future.

## 2. Policy umbrella with respect to energy efficiency in India

The Energy Conservation Act 2001 (EC Act, 2001) [4] laid down the foundation of energy efficiency in India, providing a legal mandate for the implementation of energy efficiency measures. EC Act, 2001 envisaged specified energy consumption standards for notified equipment, appliances, consumers and buildings. To fulfill the aforementioned standards, Bureau of Energy Efficiency was established in the year 2002. The mission of Bureau of Energy Efficiency was to develop policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the EC Act, 2001 with the primary objective of reducing energy intensity of the Indian economy.

The policy umbrella for energy efficiency has been widened with the introduction of National Mission for Enhanced Energy Efficiency (NMEEE) under the National Action Plan on Climate Change (NAPCC). The National Mission for Enhanced Energy Efficiency has recently proposed an Energy Efficiency Action Plan which comprises of 4 aspects. The 1st aspect is Perform, Achieve and Trade (PAT) scheme which is a market-based mechanism to enhance Energy Efficiency among the 'designated consumers or DCs' (large energy-intensive industries and facilities).

BEE is to act as the Mission Director for the PAT scheme. In addition, Energy Efficiency Service Ltd. (EESL), a joint venture of

[1] During the period 1990–91 to 2000–01, the industrial sector grew by 23% while the residential and commercial sector grew by 91%. However, during the period 2000–01 to 2006–07, the rate of growth for industrial sector increased to 33% whereas for the residential and commercial sector it declined to 45%.
[2] Assuming that projected industrial energy intensity (in GJ/t) data for 2020 holds true.
[3] Best practices data are based on Worrell et al, 2007.
[4] Out of the list of 15 designated consumers provided in the schedule of the Energy Conservation Act, 2001.

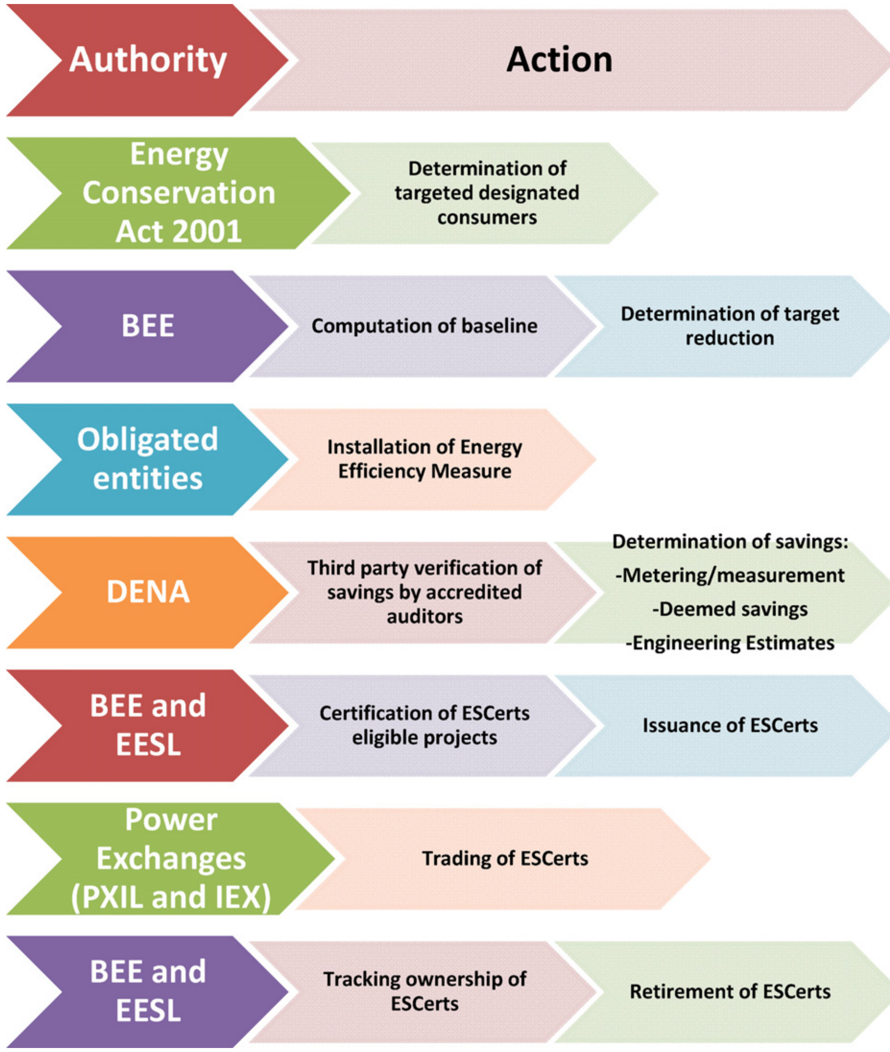



**Fig. 2.** Procedure for issuance of ESCerts.

4 central public sector undertakings viz. National Thermal Power Corporation, Power Grid Corporation of India Limited, Rural Electrification Corporation and Power Finance Corporation has been created to provide implementation leadership in the market [5].

The 2nd aspect of the National Mission of Energy Efficiency is the Market Transformation for Energy Efficiency which involves accelerated shift to energy efficient appliances in the designated sector through innovative and affordable measures [6].

The 3rd aspect is the Energy Efficiency Financing Platform which focuses on creation of mechanisms that would help finance demand side management programs in all sectors to capture future energy savings [6].

The 4th aspect is the Framework for Energy Efficient Economic Development (FEEED) which seeks to develop fiscal instruments for promotion of energy efficiency [6].

## 3. About energy saving certificates (ESCerts)

An ESCert is an instrument issued by an authorized body guaranteeing that a stipulated amount of energy savings has been achieved and has entered the Indian Energy Efficiency mandate under the PAT scheme. Each certificate is a unique tradable commodity that gives property right over additional units of intangible bundle of societal and environmental benefits created by energy saved over and above the baseline level [7]. ESCerts provide a platform for parties to trade the attributes of energy savings. An ESCert can be represented in units of electricity saving such as 1 MWh[5] (1 ESCert is issued for 1 MWh of energy saved over and above the set target).

The different stages in the life time of ESCerts along with the respective authorities involved in each stage has been represented in Fig. 2. It starts with identification of the energy savings project and determination of baseline energy usage by BEE in accordance with the Energy Conservation Act, 2001. This is followed by the implementation of the energy saving scheme by the DCs. The savings out of this scheme is measured on the basis of the baseline energy requirement and the scheme is then is put through the process of third party verification by designated energy auditors. This verification is done through metering, estimated savings, deemed savings, etc. BEE and EESL are responsible for the certification of ESCert eligible schemes/projects, issuance of ESCerts and tracking of the ownership of the same throughout its lifecycle [8]. The lifecycle of an ESCert gets completed with the retirement of the ESCert [9].

ESCerts as a tradable commodity could help to mobilize market forces and capital towards investments in energy efficiency. They can also enable the implementation of energy efficiency measures cost effectively by providing firms with the flexibility to either adopt energy efficiency measures and/or trade ESCerts in the market for adhering to the specified targets. Therefore, firms depending

[5] MWh: Megawatt hour.

on their scale and stage of operation may under or over achieve the set targets, thereby creating the forces of demand and supply of ESCerts in the market.

## 4. About the PAT scheme

Energy saving certificates will be introduced in India in 2011 under the Perform Achieve Trade scheme (PAT) propelled by the Bureau of Energy Efficiency (BEE) under the National Mission of Energy Efficiency. The scheme involves three phases. The first phase involves 'goal setting' which requires the setting of specific energy consumption (SEC) target for each plant on the basis of their current energy intensity. The target specifies the percentage by which a plant has to reduce its energy intensity in a 3-year period. India is currently in the goal setting phase. This is followed by a 'reduction phase' wherein the designated consumer tries to reduce its energy intensity according to the set target. The final phase is the 'trading phase' where the consumers who have surpassed their SEC target will be credited with tradable permits or ESCerts. A penalty will be levied on the designated consumers in case the SEC targets are not met.

The amendment to the Energy Conservation Act, 2001 which was last passed by both the houses in 2010 has provided a legal mandate to the provisions of the PAT scheme. The Energy Conservation Act provides for the issuance of energy saving certificates (ESCerts) for energy savings over and above the stipulated SEC reduction targets (under the section 14 (a)). It also provides for a non-compliance charge which stands at Rs 10 lakhs (revised from Rs 10,000 as a part of the amendment of the Energy Conservation Act, 2001) and an additional penalty of upto Rs 10,000 for each day of repeated offence (the additional penalty should not be less than the price of each metric ton of oil equivalent of energy that is in excess of the prescribed norms) [10].

### 4.1. Methodology

The methodology of this scheme involves stipulating Specific Energy Consumption Reduction targets (measured in terms of energy consumed as a proportion of the total output produced in units) for 563 energy intensive units (8 designated consumers) on a gate to gate basis, belonging to the sectors identified as designated consumers under the Energy Conservation Act. The Energy Conservation Act empowers the central government to notify the DCs based on the annual energy consumption of a plant by comparing with the threshold limit prescribed for the sector.[6] The 9 DCs/sectors identified under this scheme include the aluminum, cement, chlor-alkali, fertilizer, pulp and paper, power, iron and steel, textiles and railways. However, only 8 DCs/sectors will be participating in the 1st cycle of PAT scheme.[7] These sectors account for 60% of the total energy consumption at 231.6 mMTOE (million metric tons of oil equivalent). The majority among these 563 units belong to cement, iron and steel, power plant and textile sectors. The regional spread of these industries shows that Maharashtra, Gujarat, Tamil Nadu and Rajasthan are the most industrialized with 345 units.

### 4.2. Implementation of the PAT scheme

As a first step towards the implementation of the PAT scheme, baselines for the 563 industrial units had to be determined by BEE. For determination of the baselines, the gate-to-gate concept was adopted [11]. As part of this concept, the total energy consumption of each plant was calculated by aggregating the energy inputs (such as electricity, thermal, natural gas, fuel oil, etc.) consumed by the various sub-systems of the manufacturing process carried out in the concerned plant. For the purpose of the said calculation, the boundary of a plant is inclusive of its 'process' as well as 'physical' boundaries. Once the plant boundary has been fixed, the same will be considered for the entire PAT cycle. To arrive at the specific energy consumption baseline for each plant, the total energy consumption of each plant is taken over the total output produced by the respective plant. The rationale for choosing such a method is to facilitate comparison of energy intensity across the plants by implicitly incorporating the need of the industrial unit to expand its production capacity as well as incorporating energy efficiency measures adopted by it in the past or those that will be adopted in the future.

Thereafter, a simplified approach is followed to estimate the saving potential across the designated consumers. The data (production details and specific energy consumption (SEC) details for each designated consumer) for the previous 5 financial years, i.e. 2005–06 to 2009–10 has been collected for all the designated consumers (PAT Consultation Document). The average normalized SEC of the last 3 years (2007–08 to 2009–10) will be chosen for the purpose of baseline determination and saving potential estimation (2009–10 has been chosen as the base year). Specific energy consumption in 'tons of oil equivalent' (toe) per unit of production is estimated for each industrial sector based on total electrical and thermal specific energy consumption levels of that sector. Total energy consumption by each designated sector in toe is estimated as product of Total Production and Specific Energy Consumption of that industrial sector measured in 'toe/unit production'.

To avoid double counting in total energy consumption by designated sectors, it is important to exclude thermal power sector and to consider it separately, since the power plant sector is also supplying electricity to the other designated industrial sectors.

### 4.3. Targets under PAT scheme

Based on the baselines so calculated, targets are arrived by taking percentage reduction of current SECs required to be achieved over the defined period. The target SEC is arrived by taking the current SEC as a ratio of the best among the plants of an industrial unit. Therefore, if the best performing plant has *X*% target to reduce the SEC, the other plants would be having (Plant SEC/Best SEC = relative SEC) times of *X*% [12]. Thus for the best SEC plant the savings target is same as its percentage share in total energy consumption.

The actual energy savings target is 10 mMTOE [4] (million metric tons of oil equivalent) that shall be apportioned and disaggregated among the 8 sectors on a pro-rata basis in the same ratio as the relative specific energy consumption in the baseline year 2009–10. Thus the targets are set in conformity with the baselines for each of the 563 designated units[8] and depend on the current level of energy efficiency of the units. This implies that the percentage specific energy consumption reduction is lower for high energy efficient units. The SEC reduction targets for each phase are set for a period of 3-years that are subject to revision after the end of the reduction phase.

The next level of allocation of reduction target would correspond to the disaggregation of the sectoral reduction target to each plant within the sector. This is guided by the energy usage pattern which varies across industries due to inter industry diversities.

[6] The industries of a sector are required to submit their energy consumption every year to the Designated Agency through a mandatory reporting system which would enable the central government to decide on DC status.

[7] The railways sector has been excluded from the 1st cycle of PAT.

[8] The target setting for the power generation and fertilizer sectors is to be carried through the tariff setting process.

These diversities included scale of production, use of raw material, process technology, vintage of technology, O&M practices and type of product output. To address the issue of these diversities, the targets have been kept plant specific and a gate to gate approach shall be applied for each plant.

The reduction in energy intensity over and above the set targets provides for the issuance of the ESCerts (under the section 14 a (1)) that shall be moderated by BEE[9] which will act as the overall regulator and dispute resolution agency. Each ESCcert is equivalent to 1 metric ton oil equivalent (MTOE) of energy savings. While calculating the total energy input to the plant, all energy sources would be converted to a single unit, i.e. MTOE.[10]

These certificates will be maintained in the DEMAT form and can be exchanged between industries (within and across designated consumers) to meet their set targets through the platform of power exchanges (Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL) are the chosen power exchanges for the trade of ESCerts in India).

The lifetime of ESCerts also affects it price, therefore, shorter lifetimes of certificates may significantly distort market prices, as the market will tend to respond to short-term demand and supply forces. Hence, BEE has allowed the option of banking of these certificates which can be rolled over to meet the SEC reduction targets of the next reduction phase. The use of banking is perceived as being essential in building investor confidence and market stability.

### 4.4. Measurement and verification

SEC measurement and verification will be carried out by BEE through the designated energy auditors (DENA) appointed by them under the section 14 A/13 (p). The primary function of energy auditors is to assess and verify the SEC targets achieved by each designated consumer. Each designated consumer maintains a PAT assessment document which is validated by the DENA and verified by BEE and forms the basis of the issuance of ESCerts. The DENAs would be conducting a 'Baseline Energy Audit' in the DCs. The baseline energy audit is aimed at knowing the energy performance of various key equipments, energy balance, energy saving potential, various energy conservation options implemented in the plant, etc.

The ESCerts are then issued under the aegis of Government of India by BEE, in collaboration with Energy Efficiency Services Ltd (EESL) which acts as the overall process manager for the PAT scheme.

### 4.5. Pricing of ESCerts

The pricing of ESCerts will be market determined. However, the prices have to be very carefully determined to ensure adequate volumes so as to provide robustness to the ESCerts market and also to incorporate a sense of certainty among industries to undertake energy efficiency measures for meeting the targets. For instance, in case the targets set are low, there will be a surplus of ESCerts in the market leading to very low prices. Conversely, if the targets are too stringent, it may lead to prices of ESCerts being higher as compared to the cost of energy intensity reduction, resulting in a fall in the demand for ESCerts and eventually not providing the market with the right volumes. In both the cases, an undesirable situation will arise in the market and negatively affect its functioning.

[9] BEE is the primary agency that will oversee the PAT scheme and ensure compliance through penalties (as provided in the Energy Conservation Act, 2001).

[10] Electricity purchased from Grid: 1 kWh = 860 kcal. Solid fuel: Quantity (kg) × GCV (kcal/kg) kcal. Liquid fuel: Quantity ($m^3$) × density (kg/$m^3$) × GCV (kcal/kg) kcal. 1 MTOE = 107 kcal.

## 5. Challenges in the PAT scheme and ESCerts

One of the major problems arising during the initial phase of the PAT scheme is that the ESCerts are issued ex-post, i.e. they are issued after the verification of the savings that have taken place in the initial reduction phase. This means that there will be no traded price for ESCerts up-front and therefore requisite price signals for energy efficiency investments will not be present. This could have an implication on the initial trading volumes and could cause price volatilities (price hikes during the compliance period of the year) that might lead to sub optimal allocation of resources. Given the past response of industries to similar policies, there is more likeliness of over achievement of targets and hence over supply of ESCerts. Consequently this will result in very low prices of ESCerts. Hence it is required that an estimate of the ESCerts prices should be determined during the reduction phase to enhance the certainty and assure compliance of the scheme from the industries. This can be done through an ex-ante estimation of prices through the savings potential that have been computed.

Government involvement is of utmost importance to maintain a competitive price of ESCerts. They should work towards maintaining a minimum price (floor price) of ESCerts as in the case of RECs. This can be done by regulating the circulation of ESCerts and allowing government intervention to purchase ESCerts whenever prices approach the decided floor price.

Lastly, experience of REC market highlights that penalty clauses are not invoked despite non-compliance of renewable purchase obligations which dilutes the stringency of these obligations. In case of ESCerts, a similar situation may arise if the penalties are not invoked in an effective and time-bound manner.

## 6. Way forward for ESCerts in the Indian scenario

### 6.1. Deepening of the PAT scheme

Under the Energy Conservation Act, 2001, the industrial units in the 8 sectors whose energy consumption are exceeding a set threshold level have been chosen as the Designated Consumers (DCs). Industrial units from Cement, Fertilizer, Iron and Steel, Paper and Pulp and Thermal Power Plant with energy consumption of 30,000 metric tons of oil equivalent per year or above have been identified as DCs, whereas for Chlor-Alkali, Aluminum and Textile sector this norm is 12,000, 7500 and 3000 metric tons of oil equivalent per year or above, respectively [13]. As the PAT scheme progresses, the threshold level for identifying designated consumer can be lowered further to deepen the ambit of the PAT scheme.

### 6.2. Broadening of the PAT scheme

During the initial phases the Government of India has chosen to cover only 8 energy intensive sectors[11] out of the 15 DCs under the Energy Conservation Act, 2001. Depending upon the initial response of the ESCerts market, the PAT scheme could be widened to include the remaining sectors in a phased manner.

For instance, this can be done by including distribution utilities apart from the industrial units. It has been seen that in most countries in which ESCerts are functional have primarily targeted distribution utilities to reduce the energy intensity across various consumer categories apart from the identified designated

[11] Excludes the Railways industrial sector.

industrial consumers. The prospective designated distribution utilities by developing in house energy efficiency projects such as energy audits, replacement of incandescent bulbs, star labeling, etc. can bring about substantial lowering of energy intensities. The utilities could also partner with or contract out to other third parties like energy service companies (ESCOs), retailers and product manufacturers, etc.

### *6.3. Maintaining stability in the prices of ESCerts*

In order to reduce the environment of uncertainty for the players involved in the ESCerts market, it is essential that Government (through BEE) works towards maintaining stability in the prices of ESCerts. For this, we suggest a two pronged approach:

- Before the starting of the reduction phase, Government (through BEE) should come up with a minimum price (floor price) of ESCerts. This will help reduce market uncertainties and assure the designated consumers of a minimum return on their investment for meeting their decided reduction targets, thereby setting the stage for the ESCerts market to roll on.
- Once the ESCerts are in circulation and the market is active, it is suggested that the Government (through BEE) should maintain a price band (expressed as a percentage of the market price of ESCerts). Further, Government (Ministry of Power) should maintain a dedicated fund for intervention in the ESCerts market whenever the prices exceed the decided band in either direction.

### *6.4. Incentives for the promotion of energy efficient technologies*

- Fiscal incentives: Tax concessions (excise duties, customs, VAT, etc.) should be extended to the producers of energy efficient technologies that would be used by the targeted industries for SEC reduction.
- Financial support: Extension of the Partial Risk Guarantee fund as part of Framework for Energy Efficient Economic Development (FEEED) mechanism under NMEEE to the producers of Energy efficient technologies. This would include easy access to loans to these producers and partial coverage of risk exposure against loans extended to them.
- Setting up a dedicated fund by the Central Government (through Ministry of Power) to promote research and development on energy efficient technologies.
- Agreements, if any, between the producers of energy efficient technology and consumers (energy intensive industries) should be regulated by BEE to avoid conflicts and ensure smooth functioning of the market.
- Facilitation of energy efficient technology workshops by BEE to promote such technologies on a pan-India basis.

## 7. Summing up

Although, the PAT scheme under NMEEE and the Energy Conservation Act has provided the 1st step towards energy efficiency commitment, the success of ESCerts depends upon many factors like baseline determination, pricing of ESCerts, energy saving audits, etc.

The paper has focused on the functioning of the ESCerts market in India (under the PAT scheme). Looking at the existing framework of the PAT scheme in India, certain recommendations have been made to ensure smoother working of the ESCerts market in India. These recommendations include broadening the ambit of the PAT scheme, maintaining price stability and incentivizing producers of energy efficiency technology to invest in the market. More research needs to be carried out in this area, by undertaking rigorous cost-benefit analysis under different scenarios, for deciding on the final approach that can be pursued by policy-makers in case of India.

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